UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Participation of Distributed Energy Resource Aggregations in Markets Operated by Regional Transmission Organizations and Independent System Operators	)	**Docket No. RM18-9-000**
Distributed Energy Resources – Technical Considerations for the Bulk Power System	)	**Docket No. AD18-10-000**

Written Statement of
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Technical Conference, Docket Nos. RM18-9-000 and AD18-10-000
April 10-11, 2018
Panel 5: Incorporating DERs in Modeling, Planning and Operations Studies

Duke Energy Corporation ("Duke Energy") provides these written comments in advance of the technical conference scheduled on April 10 and 11, 2018 to discuss the participation of distributed energy resource ("DER") aggregations in Regional Transmission Organization ("RTO") and Independent System Operator ("ISO") markets and to more broadly discuss the potential effects of DERs on the bulk power system. Duke Energy appreciates the Commission's initiative to explore the impacts of DERs on the bulk power system and thanks the Commission for the opportunity to participate on the panel addressing the incorporation of DERs in modeling, planning and operations studies.

Duke Energy is on the forefront of experience with high penetrations of DERs, particularly in its North Carolina service territory, and related challenges pertaining to the transmission and distribution interface. With nearly 2,000 megawatts of solar capacity

on-line, Duke Energy Progress, the predominant utility in eastern North Carolina, is integrating large quantities of variable energy resources each day. The Carolinas (North and South) are ranked second in the nation for installed solar capacity, just behind California. Furthermore, an additional 10,000 megawatts of solar projects are seeking interconnection in the area.

Given the recent growth of DERs within the Carolinas, Duke Energy has a unique perspective on the effects of DERs on the bulk power system, especially as it relates to a regulated utility operating outside of an organized market. Duke Energy welcomes this opportunity to share its experience with modeling and planning issues that arise when integrating high levels of DERs onto the system. There are three areas, in particular, where Duke Energy's experience highlights issues related to the modeling, planning, and operational studies of DERs.

First, there are significant complexities in modeling a high-penetration DER future, particularly at the transmission and distribution interface. For example, recent transmission-connected generator interconnection studies have identified transmission constraints that will prevent additional generation from connecting in an area without significant transmission upgrades. This has introduced new challenges in how to study DER interconnections in those areas and how to identify where DER growth could be leading to similar constraints in other areas. Duke Energy has also seen how DERs can affect the bulk power system and/or distribution facilities in unintended ways. For example, while responding to a NERC Alert, Duke Energy discovered that the loss of DERs due to mis-operation and momentary cessation during transmission events could make the overall loss of generation worse than previously expected. Additionally, Duke

Energy has experienced voltage distortions caused by harmonics during transformer inrush at a large distribution-connected solar generation site, which then tripped off industrial equipment on a neighboring feeder. This event created concerns about the possible impacts of inrush associated with hundreds of utility-scale solar photovoltaic sites now online across the distribution system and introduced a new analysis to the interconnection study for future facilities.

Second, the modeling of DERs is affected by interconnection study procedures and whether DERs are studied on a first-come, first-served basis or through cluster studies. Cluster studies provide opportunities for improved modeling of DERs and are being proposed by some states, including the North Carolina Utilities Commission. There are still challenges with using cluster studies, as DERs backing out of the interconnection queue can cause the need for re-studies.

Third, Duke has experience with operational best practices for addressing reliability in a high-penetration DER environment. For example, telemetry has been important for Duke Energy to ensure visibility of DERs on its system. Maintaining telemetry on DERs greater than 250kW in Eastern North Carolina and making that data available to Transmission Operators in real-time helped ensure that Duke Energy was able to "ride through" the solar eclipse on August 21, 2017 without experiencing any reliability issues.

Duke Energy appreciates the opportunity to participate in these important discussions related to the integration of DERs and effects on the bulk power system. There are significant modeling, planning, and operational complexities associated with high penetrations of DERs, and to date, there are not uniform, straight-forward solutions.

Duke Energy commends the Commission for its leadership in addressing these challenges and looks forward to continuing to work with the Commission and the industry on these issues.